Summary of Yosemite NP and Devils Postpile NM GRI meeting September 25-26, 2002

SUMMARY
A Geologic Resources Inventory (GRI) workshop was held for Yosemite National Park (YOSE) and Devil's Postpile National Monument (DEPO) on September 25-26, 2002. The purpose was to view and discuss the park's geologic resources, to address the status of geologic mapping for compiling both paper and digital maps, and to assess resource management issues and needs. Cooperators from the NPS Geologic Resources Division (GRD), YOSE, DEPO, the University of North Carolina, and the United States Geologic Survey (USGS) were present for the workshop.

This involved field trips to various points of interest in YOSE, led by King Huber, as well as another full-day scoping session to present overviews of the NPS Inventory and Monitoring (I&M) program, the GRD, and the on-going GRI. Round table discussions involving geologic issues for YOSE and DEPO included the status of geologic mapping efforts, interpretation, sources of available data, and action items generated from this meeting. Because of time and logistical limitations, DEPO did not get a site visit during the scoping session.

For a list of meeting attendees, see **Appendix A (List of attendees for Yosemite NP and Devils Post Pile NM GRI Workshop, September 25-26, 2002).**

OVERVIEW OF GEOLOGIC RESOURCES INVENTORY (GRI)
The NPS GRI has the following goals for some 273 units with significant natural resources:

1) To assemble a bibliography ("***GRBIB***") of known geological publications to compile and evaluate a list of existing geologic maps for each unit,
2) To conduct a scoping session for each park,
3) To develop digital geologic map products for use in a GIS (geographic information system), and
4) To complete a geologic report that synthesizes much of the existing geologic knowledge about each park.

It is stressed that the emphasis of the inventory is not to routinely initiate new geologic mapping projects, but to aggregate existing "baseline" information and identify where serious geologic data needs and issues exist in the National Park System. In cases where map coverage is nearly complete (ex. 4 of 5 quadrangles for Park "X") or maps simply do not exist, then funding may be available for geologic mapping.

After introductions by the participants, Bruce Heise (NPS-GRD) presented overviews of the Geologic Resources Division, the NPS I&M Program, the status of the Natural Resource Inventories, and the Geologic Resource Inventory in particular.

Joe Gregson (NPS-NRID) presented a demonstration of some of the main features of the digital geologic database for the Black Canyon of the Gunnison NP and Curecanti NRA in Colorado. This has become the prototype for the NPS digital geologic map model as it reproduces all aspects of a paper map (i.e. it incorporates the map notes, cross sections, legend etc.) with the added benefit of being geospatially referenced. It is displayed in ESRI ArcView shape files and features a built-in Microsoft Windows help file system to identify the map units. It can also display scanned JPG or GIF images of the geologic cross sections supplied with the paper "analog" map. Geologic cross section lines (ex. A-A') are subsequently digitized as a line coverage and are hyperlinks to the scanned images.

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GRBIB

At the scoping session, individual Microsoft Word Documents of Geologic Bibliographies for YOSE and DEPO were distributed.

The sources for this complied information are as follows:

- AGI (American Geological Institute) GeoRef
- USGS GeoIndex
- ProCite information taken from specific NPS park libraries

These bibliographic compilations were validated by GRI staff to eliminate duplicate citations and typographical errors, as well as to check for applicability to the specific park. After validation, they become part of a Microsoft Access database parsed into columns bases on park, author, year of publication, title, publisher, publication number, and a miscellaneous column for notes.

For the Access database, they are exported as Microsoft Word Documents for easier readability, and eventually turned into PDF documents. They are then posted to the GRI website at: http://www2.nature.nps.gov/grd/geology/gri/products/geobib/ for general viewing.

King Huber found numerous shortcomings with the GRBIB database in that it is missing several known geologic publications. He is going to review the supplied list and supply other known publications to GRI staff.

EXISTING GEOLOGIC MAPS AND DIGITAL DATA

After the bibliographies were assembled, a separate search was made for any existing surficial and bedrock geologic maps for YOSE and DEPO. The USGS has published numerous quadrangles in the area at various scales and of variable vintage.

King Huber has published a compilation map for YOSE at *1:125,000* scale (Huber, N.K.; Bateman, P.C.; Wahrhaftig, Clyde, 1989, Geologic map of Yosemite National Park and vicinity, California, US Geological Survey, I-1874, 1:125000 scale). It does cover the entire park boundary with some extra buffer.

However, other large-scale maps have been published by the USGS, and their coverage of the quadrangles of interest is covered below:

- The Yosemite Quadrangle (Peck, Dallas L., 2002, Geologic Map of the Yosemite quadrangle, central Sierra Nevada, California, US Geological Survey, I-2751, 1:62500 scale) covers the El Capitan, Half Dome, Wawona, and Mariposa Grove quadrangles;

- Tower Peak Quadrangle (Wahrhaftig, Clyde, 2000, Geologic map of the Tower Peak quadrangle, central Sierra Nevada, California, US Geological Survey, I-2697, 1:62500 scale); covers Emigrant Lake, Tower Peak, Tiltill Mountain, and Piute Mountain;

- the Yosemite Valley (Calkins, F.C.; Huber, N.K.; Roller, J.A., 1985, Bedrock geologic map of Yosemite Valley, Yosemite National Park, California, US Geological Survey, I-1639, 1:24000 scale) covers portions of the Tamarack Flat, Yosemite Falls, Tenaya Lake, El Capitan, Half Dome, and Merced Peak quadrangles that comprise the Yosemite Valley.

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The *1:125,000*-scale compilation map by Huber has been digitized in ESRI ArcInfo format by YOSE staff. It does cover the entire park boundary. **Appendix B** has a picture of the map in relation to the quadrangles of interest.

Joe Meyer supplied the following explanation with respect to the digital coverage of this map:
Metadata (short-form)
Geology of Yosemite National Park and Vicinity, California
N. King Huber, Paul C. Bateman, and Clyde Wahrhaftig (1989)
USGS map I-1874

Huber used a stable-base mylar of an enlargement of the 1:125000 scale USGS map Yosemite National Park and Vicinity (1958) as a base map for his geologic delineations. The approximate scale of the enlargement was 1:96000.

About 1984 or 1985, Huber's preliminary map (original ink delineations) was transferred to stable base mylars by Walter Sydoriak (YNP research staff) for the purpose of digitizing. The linear features (fault lines, moraines, etc.) and labels were not transferred to the stable base mylar, because the delineations had to be polygonal and could not be a mix of polygons and lines (a limitation of GIS software at the time). Huber's map did not delineate geologic boundaries under water bodies such as Hetch Hetchy Reservoir; park staff interpreted the locations of these boundaries to comply with the "polygonal" requirement. Other than the geologic boundaries beneath waterbodies, there should be no differences in the polygons and labels between Huber's preliminary map (1984) and the published map (1989).

This stable base mylar was digitized by Chicago Aerial Mapping Survey under contract. After digitization, the NPS-WASO-Geographic Information Systems Division in Denver, Colorado attributed the polygons (i.e. added the labels), which were verified by park staff. The finished product was in SAGIS format, and was converted to GRASS format in the late 1980s. The GRASS data were converted to Arc/Info coverage format in 1995 by J. Meyer, using the v.out.arc GRASS command, the Arc/Info Generate command (to generate the polygons and their respective labels), and the Arc/Info join item command (to associate the labels with the polygons). In 1998, a few missing polygon labels were added to the GIS data by J. Meyer: the correct labels were derived from the published map.

In general, our confidence in this data is very high. Great care was taken in making the original delineations, transferring the delineations to stable-base mylars, digitizing, and attributing.

DEPO has a published paper map at *1:62,500* scale (Huber, N.K.; Rinehart, C.D., 1965, Geologic map of the Devils Postpile quadrangle, Sierra Nevada, California, US Geological Survey, GQ-437, 1:62500 scale) that encompasses four 7.5' quadrangles (Mount Ritter, Mammoth Mountain, Crystal Crag, and Cattle Mountain). It is not known whether this map has been digitized at the present time.

However, a more refined map has been produced by the USGS by David Clow and Kenneth Collum. It is not known if this map is published, but it was suggested during the scoping session to use this map instead of GQ-437 for the official park map. Bruce Heise is tracking down more information about this map. It is previewed in "The Story of Devils Postpile: A Land of Volcanic Fire, Glacial Ice and an Ancient River". This publication was released by the Sequoia Natural History Association in 2002.

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YOSE MANAGEMENT NEEDS

Research Projects (refer to 2001 research symposium report)

- Surficial geology and processes (especially in relation to known trails)
  - Correlations between surficial geology and:
    - Ecosystem sensitivity/resiliency
    - Fire occurences/effects0
    - Water quality
    - Wildlife habitat and species distribution
    - Hydrological hazards (e.g. floods, erosion)
- Glacial monitoring
- Tioga glaciation map
- Geologic age dating
- Soils (complete in FY03)
- Map joints and fracture analysis in rocks (related to ground water hydrology, chemistry and rock falls)
- Aquifer hydrology
- Ground water quality inventory/research-trace element geochemistry
- GPS monitoring of active tectonics (define and revisit benchmarks)
- Applied research:
  - Geohazards (rock falls, seismic activity)
  - Geosuitability (building/facility placement)

Issues/Hazards

- Global climate change (precipitation changing from snow to rain, how this will affect flooding, hydrologic systems, etc.)
- Dedicated symposium to geology and hydrology research needs for the South Sierra Network
- Articulate geologic research needs and priorities to attract outside funding resources (e.g. Yosemite Fund, NSF, USGS, etc.)
- Earthquakes/poor seismic monitoring (e.g. rock falls, Mammoth Lakes, low earthquake hazard)
- Data management/delivery; map-based information delivery system
- Geologic interpretive stops
- Recognition of YOSE as world-class geologic research area; magmatic terrain

DEPO MANAGEMENT NEEDS

Research projects

- Dating of lava flows
- Monitoring glacial polish
- Ground water chemistry of springs in the meadow
- Carbon dioxide flow in the soil and possible tree kill
- Hydrology/geomorphology of San Joaquin River
- Global climate change relative to species diversity (high snowfall now)
- Historic flows of the San Joaquin (contact NPS-Water Resources Division)
- Possible effects to DEPO's springs and watershed from proposed ground water pumping on San Joaquin ridge

Issues/Hazards

- Need climate summary

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GEOLOGIC REPORTS

- Huber, N. King, The Geologic Story of Yosemite National Park, 1989, Yosemite Association, 64 pages

- Matthes, F.E., 1930, Geologic history of the Yosemite Valley: U.S. Geological Survey Professional Paper 160, 137 pages

- Huber, N. King, and Eckhardt, Wymond W., The Story of Devils Postpile: A land of volcanic fire, glacial ice and an ancient river, 2002, Sequoia Natural History Association, 42 pages

All reports are written for interpretive needs for the park, not technical needs or resource management issues, so would need to be enhanced for the purposes of the GRI report.

Appendix A
List of attendees for Yosemite NP and Devils Post Pile NM GRI Workshop
September 25-26, 2002

LAST NAME	FIRST NAME	TYPE	AFFILIATION	TITLE	PHONE	E-MAIL	Field Trip	Scoping Session
Allen	Lindy	federal	NPS-GRD	admin. Assistant	303-969-2090	lindy_allen@Nps.gov	Yes	Yes
Bumgardner	Steve	other		videographer	559-565-3949	s_bumgardner@hotmail.com	Yes	No
Butler	Mark	federal	NPS-YOSE	physical scientist	209-379-3260	mark_butler@nps.gov	No	Yes
Connors	Tim	federal	NPS, Geologic Resources Division	geologist	(303) 969-2093	Tim_Connors@nps.gov	No	No
Despain	Joel	federal	NPS-SEKI	cave specialist	559-565-3717	joel_despain@nps.gov	Yes	Yes
Dulen	Deanna	federal	NPS-DEPO	superintendent	760-934-8100	deanna_dulen@nps.gov	No	Yes
Galipeau	Russell	federal	NPS-YOSE	chief of cultural resources	209-379-1219	russell_galipeau@nps.gov	No	Yes
Glazner	Allan	academic	University of North Carolina at Chapel Hill	professor	919-962-0689	afg@unc.edu	Yes	Yes
Gregson	Joe	federal	NPS, Natural Resources Information Division	physical scientist	(970) 225-3559	Joe_Gregson@nps.gov	yes	Yes
Heise	Bruce	federal	NPS, Geologic Resources Division	geologist	(303) 969-2017	Bruce_Heise@nps.gov	Yes	Yes
Huber	King	federal	USGS	geologist	650-329-4925	khuber@usgs.gov	Yes	Yes
Meyer	Joe	federal	NPS-YOSE	GIS	209-379-1185	joe_meyer@nps.gov	Yes	Yes
Murchey	Bonnie	federal	USGS	geologist	650-329-4926	bmurchey@usgs.gov	Yes	Yes
VanWagtendonk	Jan	federal	USGS-WERC	research forester	209-379-1306	jan_van_wagtendonk@usgs.gov		

Appendix B
Quadrangles of Interest for Yosemite NP and Devils Post Pile NM